Marine Vapor Control Requirements

EPA & State Requirements

Under the authority of sections 183(f) and 112, the EPA, in September 1995, promulgated two sets of national standards for marine loading facilities designated as major sources to control VOC and HAP emissions during tank vessel loading operations. These standards are contained in Title 40 Code of Federal Regulations (CFR), Part 63, Subpart Y. They require:

a. By September 19, 1997, terminals having throughput of ten million barrels per year or more of gasoline, or 200 million barrels per year or more of crude oil to collect VOC vapors displaced from marine tank vessels during loading of commodities with vapor pressures equal to or greater than1.5 psia, and to reduce the captured VOC emissions by 95% by weight when using vapor recovery techniques or 98% by weight when using vapor combustion techniques; and
b. By September 19, 1999, terminals having emissions of ten tons per year or more of each individual HAP, as listed in Title I, section 112, of U.S. CAAA of 1990, or 25 tons per year or more of all HAP combined to collect HAP vapors displaced from marine tank vessels during loading of commodities with vapor pressures equal to or greater than1.5 psia, and to reduce the captured HAP vapors by 95% to 98% by weight when using vapor control technologies.
c. Valdez marine terminals, which fall under these categories, are required to comply by March 19, 1998.

Tank vessels are required to be vapor-tight and have a vapor collection system installed, which is compatible with the terminal's vapor control system in order to be loaded with the specified cargoes at these terminals.

In addition, the U.S. EPA in 40 CFR part 61, subpart BB, requires collection of vapors displaced from marine tank vessel cargo tanks during loading of cargoes containing 70% or more benzene by weight.

Many coastal and Great Lake States have issued regulations requiring major terminals to control VOC vapors emitted from crude oil, gasoline blends, benzene, and other liquid cargoes during various marine tank vessel operations. These operations include loading, ballasting, lightering, degassing, purging, venting, and tank cleaning. In general, these State regulations require reduction of marine tank vessel emissions by 95% by weight when using vapor recovery technology or 98% by weight when using combustion technology. The minimum reduction is 90% by weight. In addition, tank vessels are required to be vapor-tight and equipped with vapor collection systems in order to operate at these terminals.

USCG Requirements

Controlling flammable and combustible organic vapors presents numerous hazards including cargo tank overfill, overpressure or vacuum, cargo spillage, and fire and detonation of the flammable vapors. Under the authority of section 183(f) of the Clean Air Act, the Coast Guard has

issued regulations to ensure the safety of equipment and operations of VCSs that control vapors of crude oil, gasoline blends, or benzene emitted from a tank vessel's cargo tanks. These regulations are treated separately in the Code of Federal Regulations for vessel and facility requirements. In general, the Subchapter D, tank vessel regulations in 46 CFR part 39 contain requirements for vapor collection equipment installed on tank vessels, while the regulations in 33 CFR 154 Subpart E, contain the requirements for facility based vapor control systems.

Vessel Requirements

The majority of vessel VCS regulations can be found in 46 CFR Part 39. Important areas addressed by these regulations include:

a. Cargo gauging system (§39.20-3);
b. Tankship liquid overfill protection (§39.20-7);
c. Vapor overpressure and vacuum protection (§39.20-11);
d. High and low vapor pressure protection for tankships (§39.20-13);
e. Operational requirements (§39.30-1);
f. Lightering and topping-off operations with vapor balancing (§39.40); and
g. Personnel training (§39.10-11).

Other applicable regulations for vessel VCS and loading operations are contained in 33 CFR section 155.750 (Oil transfer procedures), 33 CFR section 156.120 (Requirements for transfer), 33 CFR section 165.170 (Equipment tests and inspections), and 46 CFR section 35.35-30 (c) (Declaration of inspection).

Although the regulations permit vapor to be processed on board a tank vessel, in most cases the collected vapors are sent ashore to the facility VCS for processing. If the vapor processing unit is located on board a tank vessel, it must meet the requirements of 33 CFR part 154, subpart E to the satisfaction of the Commandant of the Coast Guard in addition to complying with the requirements of 46 CFR part 39.

The Coast Guard has allowed chemical tankships to use flexible hoses or spool pieces, as short as practicable but not exceeding 3 meters, in lieu of the fixed piping required by 46 CFR 39.20-1(a).

Facility Requirements

The bulk of the requirements for facility VCS are contained in the regulations of 33 CFR 154, Subpart E. They address the safe design and operational aspects of facility based systems focusing on the following areas:

a. Liquid overfill protection (§154.812)
b. Overpressure and vacuum protection (§154.814)
c. Fire, explosion and detonation protection (§154.820)
d. Requirements for inerting, enriching and diluting systems (§154.824)
e. Vapor compressors and blowers (§154.826)
f. Vapor recovery and vapor destruction systems (§154.828)
g. Personnel training and operating requirements (§154.840 and §154.850)
h. Design, performance, and testing standards for detonation and flame arresters (§154 Appendix A and B)

Additional Requirements for Cargoes Other Than Crude Oil, Gasoline, and Benzene

The VCS requirements found in 33 and 46 CFR specifically address facilities and vessels transferring cargoes of crude oil, gasoline blends or benzene. At the time the regulations were written, these were the only cargoes that states were targeting for vapor control. Since that time, an increasing number of facilities have been required to collect the vapors of other hazardous cargoes.

A system, which collects vapors of flammable or combustible cargoes other than crude oil, gasoline blends or benzene, must meet the requirements prescribed by the Commandant (G-MSO). These requirements are contained in a Coast Guard policy letter 16703/33-154 of May 5, 1992.

This policy letter addresses the issue of cargo compatibility and the requirement for cargo specific oxygen/hydrocarbon analyzer alarm and shutdown set points. It waives the fire, explosion and detonation protection requirements for systems controlling vapors of Grade E cargoes, and cargoes having a closed cup flash point greater than 60° C.

The letter also adds special requirements for controlling the vapor of cargoes having a high freezing point, the potential to polymerize, or a vapor growth rate greater than 25%. Systems controlling vapors of high freezing point cargoes must be designed to prevent freezing of vapor or condensate at ambient temperatures. Systems that control vapors of cargoes with the potential to polymerize must be equipped to detect polymer buildup. Systems controlling vapors of high vapor growth rate cargoes must use the vapor growth rate factor in pressure drops calculations, and when determining the cargo's maximum allowable loading rate.

Over 70% of certified facility VCSs are certified to collect vapors from cargoes other than crude oil, gasoline blends, or benzene.

VCS Guidelines for Tank Cleaning Facilities

Several States now require vapor control at tank barge cleaning facilities during gas freeing and cargo tank cleaning operations. In responding to this new state requirement, in April 1996 the Coast Guard developed a Navigation and Vessel Inspection Circular (NVIC), No. 1-96 to provide safety guidelines for these facilities. This NVIC recommends safety standards, based on recommendations from a subcommittee of the Chemical Transportation Advisory Committee (CTAC) on marine VCSs, for the design and operation of a marine VCS at tank barge cleaning facilities during gas-freeing and tank cleaning operations. For the most part, the guidelines follow the requirements in the 33 CFR 154, Subpart E regulations because the dangers of handling flammable vapors are essentially the same.